Claims

1. A coating solution for forming transparent conductive tin oxide film, which solution is intended to be used for forming, through a coating method, transparent conductive film predominantly containing tin oxide, characterized by comprising an aqueous solution containing stannic acid as its major component, and a water-soluble polymer having a polar group, which polymer is dissolved in the aqueous solution in the presence of at least one compound selected from the group consisting of ammonia and a water-soluble amine.

2. A coating solution for forming transparent conductive tin oxide film according to claim 1, wherein the stannic acid is obtained by dissolving, in water, a hydroxide (stannic acid) obtained through hydrolysis of a tin compound selected from the group consisting of tin halides, organotin halides, stannate salts, and esters containing tin.

3. A coating solution for forming transparent conductive tin oxide film according to claim 2, wherein the tin compound is a tin chloride.

4. A coating solution for forming transparent conductive tin oxide film according to claim 1, wherein the water-soluble polymer having a polar group is at least one species selected from the group consisting of poly(vinyl alcohol) (PVA), polyvinylacetamide (PNVA), polyvinylformamide (PNVF), polydimethylacrylamide (PDMAA), polyacrylamide (PAAM),

polyacrylmorpholine (PAM), hydroxyethyl cellulose (HEC), hydroxypropyl cellulose (HPC), and carboxymethyl cellulose (CMC).

5. A coating solution for forming transparent conductive tin oxide film according to claim 1, wherein the water-soluble polymer having a polar group is contained in an amount of 0.1-5 wt.%.

6. A coating solution for forming transparent conductive tin oxide film according to claim 1, wherein the pH of the solution is 10 or more.

7. A coating solution for forming transparent conductive tin oxide film according to claim 1, wherein the water-soluble amine is at least one species selected from the group consisting of tetramethylammonium hydroxide, triethylamine, diethylamine, trimethylamine, and dimethylamine.

8. A coating solution for forming transparent conductive tin oxide film according to claim 1, wherein the solution contains, as a dopant, a water-soluble compound containing at least one of antimony, bismuth, and niobium.

9. A coating solution for forming transparent conductive tin oxide film according to claim 1, wherein the solution contains a water-soluble organic compound containing fluorine as a dopant.

10. A transparent conductive tin oxide film, characterized by being formed by dissolving a water-soluble polymer having a polar group in an aqueous solution

containing stannic acid as its major component and in the presence of at least one compound selected from the group consisting of ammonia and a water-soluble amine, to thereby form a transparent coating solution; applying the coating solution onto an object; and drying and heating the object to yield a tin oxide film.

11. A transparent conductive tin oxide film according to claim 10, wherein the water-soluble polymer having a polar group is at least one species selected from the group consisting of poly(vinyl alcohol) (PVA), polyvinylacetamide (PNVA), polyvinylformamide (PNVF), polydimethylacrylamide (PDMAA), polyacrylamide (PAAM), polyacrylmorpholine (PAM), hydroxyethyl cellulose (HEC), hydroxypropyl cellulose (HPC), and carboxymethyl cellulose (CMC).

12. A transparent conductive tin oxide film according to claim 10, wherein the film contains, as a dopant, a water-soluble compound containing at least one of antimony, bismuth, and niobium.

13. A transparent conductive tin oxide film according to claim 10, wherein the film contains a water-soluble organic compound containing fluorine as a dopant.

14. A transparent conductive tin oxide film according to claim 10, wherein the film has a specific resistance of less than 1×10^{-2} $\Omega \cdot cm$.

15. A method for producing transparent conductive tin oxide film, characterized by comprising dissolving a water-soluble polymer having a polar group in an aqueous solution

containing stannic acid as its major component and in the presence of at least one compound selected from the group consisting of ammonia and a water-soluble amine, to thereby form a transparent coating solution; applying the coating solution to an object, to thereby form a coating film; and drying and heating the coating film, to thereby form transparent conductive tin oxide film.

16. A method for producing transparent conductive tin oxide film according to claim 15, wherein the transparent coating solution comprises a hydroxide (stannic acid) dissolved in the solution, which hydroxide has been obtained through hydrolysis of a tin compound selected from the group consisting of tin halides, organotin halides, stannate salts, and esters containing tin.

17. A method for producing transparent conductive tin oxide film according to claim 16, wherein the tin compound is a tin chloride.

18. A method for producing transparent conductive tin oxide film according to claim 15, wherein the water-soluble polymer having a polar group is at least one species selected from the group consisting of poly(vinyl alcohol) (PVA), polyvinylacetamide (PNVA), polyvinylformamide (PNVF), polydimethylacrylamide (PDMAA), polyacrylamide (PAAM), polyacrylmorpholine (PAM), hydroxyethyl cellulose (HEC), hydroxypropyl cellulose (HPC), and carboxymethyl cellulose (CMC).

19. A method for producing transparent conductive tin

oxide film according to claim 15, wherein the water-soluble polymer having a polar group is contained in an amount of 0.1-5 wt.%.

20. A method for producing transparent conductive tin oxide film according to claim 15, wherein the water-soluble amine is at least one species selected from the group consisting of tetramethylammonium hydroxide, triethylamine, diethylamine, trimethylamine, and dimethylamine.

21. A method for producing transparent conductive tin oxide film according to claim 15, wherein the transparent coating solution contains, as a dopant, a water-soluble compound containing at least one of antimony, bismuth, and niobium.

22. A method for producing transparent conductive tin oxide film according to claim 15, wherein the transparent coating solution contains a water-soluble organic compound containing fluorine as a dopant.

23. A method for producing transparent conductive tin oxide film according to claim 15, wherein the coating film is dried at 90°C to 100°C.

24. A method for producing transparent conductive tin oxide film according to claim 15, wherein the coating film is heated at 400°C to 700°C.